



# The River Mile Water Quality

## Lesson # 10

### Water Conservation

### How Big Is My Water Footprint?





## LESSON # 10

### Water Use: How Big Is My Water Footprint?

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#### Suggested duration:

15 m intro in L 5  
3-5 days data collection  
90 m analyzing results

#### Inquiry Question:

What is our water consumption level and how much can we reduce our water use?

#### Inquiry Process:

Collecting data and statistical analysis

#### Standards:

PS3

#### Formative Assessments:

- Data collection
- Statistical analysis
- Use Reduction
- Reflection

#### Materials:

Science journal

#### Handouts:

Water Use Home Audit  
How Big is Our Water Footprint?

#### Credits/Citations:

Adapted from Water  
Water... Math Task  
by Sean McGrath,  
Academy for Global  
Studies, Austin, TX

#### INTRODUCTION:

Water quality and quantity are a result of choices we make every day in the products we use, the energy required to power our lifestyles and our household water consumption. How much water does my family use for watering lawns, washing clothes, cleaning and consumption?

In this lesson students document and measure their family water consumption and develop a plan to reduce water use by 5-10%.

#### STUDENT WORK AND ASSESSMENT

Detailed water use observations, accurate consistent measurement of water consumption and journal reflections on water use reduction.

#### QUESTIONS TO EXPLORE/INSTRUCTIONS/PROCEDURE

1. Introduce the Water Footprint study as homework one week prior to this lesson
2. Students research their home water consumption for 5 days making observation, measurements and reading the water meter. *Full details are provided in the project guidelines*
3. Based on the data collected students create a plan to reduce their personal consumption by 5-10 % and ask family members to participate in the plan.
4. Students keep a reflective journal in addition to the measurements and water meter readings to determine the percent reduction in water consumption achieved.
5. Today students present their water use data, observations and reflections. They statistically compare household water use to determine the mean, median and mode. Students discuss their water use reduction plans, the percent savings and compare statistically to determine actions that produced the most significant reduction in water use.

#### OPTIONAL ACTIVITY:

Based on the analysis of student water use and reduction data, students may wish to implement water use reduction ideas shared by classmates

# WATER QUALITY: WATER USE HOME AUDIT

## HOW BIG IS MY WATER FOOTPRINT?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### **Essential Question:**

- How is water quality altered by the natural process of filtration through various types of soils?

### **Inquiry Question:**

How big is our water consumption level and how much can we reduce our water use?

### **Objectives:** You will:

- a. Research your home water consumption for 3 days making observations, measurements and if available, reading the water meter . *Step by step details are provided in the pages 3-15*
- b. Use the data you collect with the provided constants, and calculate your personal daily average consumption (DAC).
- c. Calculates the cost of your weekly water use and compared the water use cost to an equivalent number of gallons of gasoline at the current cost of \$3 / gallon.
- d. Use your daily average consumption to analyze your water use behavior patterns and create a plan to reduce your personal consumption by 5-8 %. Ask family members to participate in the plan.
- e. Implement you water reduction plan for 3 days and collect new water use data, measurements and water meter readings to determine what percent reduction in water consumption you and your family achieved.
- f. Keep a reflective journal to record you thought feeling, insights and new ideas as you conduct this project.
- g. Present your water use data, observations and reflections to your classmates. Statistically compare household water use across the class and determine the mean, median and mode. Discuss your water use reduction plans, the percent savings and compare statistically to determine which actions produced the most significant reduction in water use.

**Introduction:**

Water quality and quantity are a result of choices we make every day in the products we use, the energy required to power our lifestyles and our household water consumption. How much water does my family uses for watering lawns, washing clothes, cleaning and consumption?

In this lesson students document and measure their family water consumption and develop a plan to reduce water use by 5-10%.

**Assessment:**

Detailed water use observations, accurate consistent measurement of water consumption and journal reflections on water use reduction

**Think Time:**

Identify the many ways we use water daily in all we do and consume.



## PART 1: HOW BIG IS MY WATER FOOTPRINT?

**Determine your personal, home daily water usage.**

1. Keep a log of the following activities for three days.
2. Calculate the three-day average for each activity: number of toilet flushes, minutes of showering time and minutes of faucet time. Loads of laundry and dishwasher loads.
3. Record your data in the table below:

<b>Personal Water Use Data</b>					
	<b>Number of Toilet Flushes</b>	<b>Minutes of Shower Time</b>	<b>Minutes of Faucet Time</b>	<b>Load of Laundry</b>	<b>Loads in Dish washer</b>
<b>Day 1</b>					
<b>Day 2</b>					
<b>Day 3</b>					
<b>3 Day Average</b>					

**Write your reflections about the experience.**

My thoughts, feelings, insights, questions or new ideas

Determine what type of toilet, shower-head and faucet you have at home. If you are not certain your home has “Low Flow” toilets and faucets use the greater values.

<b>Estimated Water Flow Rates</b>					
	<b>Toilet Gal/Flush</b>	<b>Shower Gal/Min</b>	<b>Faucet Gal/Min.</b>	<b>Washing Machine Gal/load</b>	<b>Dish Washer Gal/load</b>
<b>Ultra Low Flow</b>	1.6	1.5	1.5 w/aerator	21.0 Front Load	NA
<b>Low Flow</b>	3.5	2.5	2.5	26 Wash Recycle	NA
<b>Conventional</b>	5.0	5.0	3.0	37	15

- Calculate the average daily water consumption for each activity, and then combine to determine your daily water consumption

<b>Average Daily Water Consumption</b>			
	<b>Number or Time</b>	<b>Water Flow Rate</b>	<b>Total</b>
<b>Average Number of Flushes</b>		gpf	gallons
<b>Average Shower Time</b>		gpm	gallons
<b>Average Faucet Time</b>		gpm	gallons
<b>TOTAL</b>			gallons per day

## PART 2: HOW BIG IS MY FAMILY'S WATER FOOTPRINT?

1. If available, use a current water bill to calculate your family's daily average consumption (DAC) of water (gallons/day).

WHEN PAYING IN PERSON - PRESENT BOTH PARTS AND PLACE THIS PART FOR YOUR RECORDS

<b>Acct No:</b> 9580	Deposits:	0.00	Bill Date: Sep 14, 2010
2206 S SHERMAN ST			Previous Bill Date: Aug 13, 2010
Previous Bill:	77.99		<b>WATER USAGE</b>
Payments: 08/18	77.98CR		
Beginning Balance:	0.00		Read Date    Current Read    Usage    Read Method
Adjustments:	0.00		08/26            6074            63    Actual
Current Charges:	122.62		
<b>Total Due:</b>	<b>122.62</b>		Water Usage in Cubic Units            63
			Water Usage in Gallons                47,124
09/14 1-68GAL REFUSER CART	24.88		
09/14 SEWER RESIDENTIAL COLLECT	3.89		
09/14 SEWER TREATMENT/RATE STAB	33.54		
09/14 STORMWATER	3.60		
09/14 WATER RESIDENTIAL CONSUMP	44.64		
09/14 WATER SERVICE CHARGE	12.07		

**Example**  
above:  
water  
usage in  
gallons =

47,124 gallons

Number of days August 14 to September 14 = 32 days

47,124 gallons divided by 32 days = 1,472.625 gallons per day

Example DAC: 1,472.61 gallons per day

2. Use your family's DAC to create a model that can predict your family's water use over time measured in days.

My family's DAC \_\_\_\_\_ gallons per day

Model: \_\_\_\_\_

Use the model to make a 7-day prediction.

3. Prediction: In seven days, my family will use \_\_\_\_\_ gallons of water.

4. Optional for homes with meters: Test your model. You are going to use your actual water meter readings to test the accuracy of your model.



- a. You will need a small crowbar to remove the plate.
- b. Read your water meter today and again in seven days.
- c. Make sure you have the right meter. The meter number is on the cap.



	Reading
Date _____	
Date _____	
Difference	

- 5. Compare your prediction to the actual water usage. What might explain any discrepancies? Are leaking pipes a possibility?
- 6. Which is the better predictor of your family’s DAC, the meter reading or the model? Explain.

## PART 3: REDUCING MY WATER FOOTPRINT

**Your task is to reduce your water consumption by \_\_\_\_\_ %. (See part 1, no. 2)**

1. What can you do to reduce your personal water consumption? Get in groups of three and brainstorm ideas on how to reduce your water consumption. Be ready to share your ideas with entire class.

Group ideas for reducing water consumption:

My personal plan for reducing my water consumption:

Determining the target water consumption per week

2. Use what you learned from your work on Parts 1 & 2 to determine the following:

<b>My Family's DAC</b>	<b>g</b>
<b>My Personal DAC</b>	<b>g</b>
<b>My commitment to reduce my personal DAC by...</b>	<b>%</b>
<b>...which is equal to</b>	<b>g</b>

3. Now, use the information from #2 above to set your weekly target.

<b>My personal target per week</b>	<b>g</b>
<b>My family's target per week</b>	<b>g</b>

4. **Take Action!** Put your plan to reduce your water consumption in place for seven days. Use actual meter readings to see if you can hit your family's target usage per week.

	<b>Reading</b>
<b>Date</b> _____	
<b>Date</b> _____	
<b>Difference</b>	

## PART 4: INFLUENCING OTHERS

### Part 4: Influencing others

**Document your findings about the amount of water your family uses, and make suggestions to your family about for how to reduce their water consumption.**

Your documentation can take the form of

- a letter to your family;
- a formal, written report;
- an article for the family newsletter; or
- a presentation (including slides and a script) to your family.

### In this assignment, you are to

- Describe how much water your family uses per week.
- Use both everyday language and the mathematical findings to explain how you arrived at this description of the water usage.
- Use your mathematical findings to describe the potential impact of any changes in the amount of water consumed.
- Incorporate persuasive strategies (e.g., cost-benefit analysis, bandwagon, appeals for integrity, problem/solution techniques, and etc.) to craft your argument.
- Describe potential struggles and pitfalls that you learned from your own personal experience.
- Make recommendations about how your family can reduce their water consumption and why it might be important to do so. Include what you have learned about water usage and how water conservation is important for protecting the ecosystem at your River Mile site.